

Surgical treatment results of parapharyngeal space tumors: a report of 22 cases

Authors' Contribution:

A—Study Design
B—Data Collection
C—Statistical Analysis
D—Data Interpretation
E—Manuscript Preparation
F—Literature Search
G—Funds Collection

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Article history: Received: 08.05.2018 Accepted: 15.05.2018 Published: 31.08.2018

ABSTRACT:

Introduction: Parapharyngeal space (PPS) is the anatomical area lateral to the upper pharynx and clinically important due to PPS tumors. They account for less than 1% of head and neck neoplasms. Both benign and malignant neoplasms may arise there and typical for this localization is diversity of histological origin. Complete surgical excision is still the basis of treatment.

Aim of the study: Evaluation of the results of surgical treatment of PPS tumors in the Department of Otolaryngology at the Medical University over the period 2015–2017.

Material and methods: A retrospective analysis of medical records including complaints, physical examination, results of imaging studies, surgical approach, postoperative complication and histopathological results in 22 patients with a diagnosis of a PPS tumors.

Results: The most frequent complaints reported by the patients were: discomfort in the throat, dysphagia, hearing disorders and a palpable tumor on the neck. Asymptomatic course of the disease was demonstrated in 4 cases. All patients were treated surgically: 2 with transoral approach, 9 with transparotid-transcervical approach, 11 with transcervical approach. In most cases the tumor was removed radically. In 2 patients intracapsular tumor resection was performed. Based on histopathological examination the benign lesions dominated (18/22). In 4 cases malignant neoplasms were diagnosed: carcinoma ex pleomorphic adenoma, adenoid cystic carcinoma and two cases of squamous cell carcinoma. The most common origin of PPS tumors was deep lobe of parotid gland and for this group 11 patients had diagnosis of pleomorphic adenoma. Other diagnosis included: paraganglioma, neurofibroma, hemangioma, lymphangioma and rhabdomyoma. Postoperative complications occurred in 9 patients and presented as hoarseness and dysphagia due to paresis of the lower group of cranial nerves (IX, X, XII). Significant intraoperative bleeding during surgery occurred in 2 cases and ligation of the external carotid artery was necessary.

Conclusion: Due to the anatomical topography of PPS and its content with the essential vessels and the lower group of cranial nerves, the surgical treatment of pathology of this area is still a challenge for head and neck surgeons. The decrease of voice quality and impaired speech and swallowing should always be considered as complications post the surgical resection in PPS.

KEYWORDS:

parapharyngeal space, neck tumor, salivary gland tumor, surgical treatment

INTRODUCTION

Parapharyngeal space (PPS) tumors, are rare pathologies and comprise approximately 0.5% of all head and neck tumors [1]. Benign tumors dominate in this area and are diagnosed in 80% cases [2]. The most common histopathological type of PPS tumor

is pleomorphic adenoma in the deep lobe of parotid gland, whereas neurogenic tumors are the second most frequent type [2-4]. Malignant PP tumors mainly derive from the parotid gland [5,6].

In clinical practice, PPS tumors are challenging both in diagnostics as well as surgical treatment. They develop in deeply

located anatomical space and for a long time the growing tumor may remain asymptomatic.

PPS is located to the side of the pharynx wall, in the suprahyoid neck and extends in the shape of an inverted cone between the hyoid bone and the base of the skull. Topographically and clinically, PPS is divided into prestyloid space and retrostyloid space, where the border is defined by the styloid process and muscles attached to it: stylohyoid, hyoglossus and stylopharyngeus. This space is therefore inaccessible directly, neither during palpation, nor by the ultrasounds, that are most frequently performed in diagnostics of superficial lesions of the neck.

Diagnosis of a PPS pathology requires tomography imaging (CT) as well as magnetic resonance imaging (MR). These methods allow to specifically determine tumor size and location, and therefore predict its histopathological type. Lesions in the prestyloid space most often derive from the parotid gland, whereas in the retrostyloid space, there most often occur paraganglioma and neuroma [3]. Surgery is the basis to treat PPS tumors, and information obtained preoperatively regarding tumor type have a significant influence on the choice of surgical approach, extent of resection, tumor embolization prior to surgery as well as predicting possible complications following tumor resection and planning rehabilitation. Preparing a relevant management plan it is particularly important taking into account limited access to PPS because of surrounding facial bones and masseters [7,8]. Surgical approach without incision and resection of the bony structures is narrow and must regard the control over significant anatomical structures in this area. Particular complications of PPS surgery are associated with the possibility of damaging major cervical vessels: internal jugular vein as well as external and internal carotid arteries, and neural structures - the lower group of cranial nerves (9th to 12th cranial nerve) and sympathetic chain

There are four main approaches that are applied in surgical treatment of parapharyngeal space pathologies: transcervical, transparotid -transcervical, transoral and transmandibular [6,9,10].

The work provides an analysis of clinical symptoms, imaging test results and applied methods of surgical treatment as well as postoperative complications in patients with PPS tumors treated in the period 2015-2017 to confront data from literature in order to improve the diagnostic and therapeutic process in this group of patients.

MATERIAL AND METHODS

The work comprises a retrospective analysis of medical docu-

mentation of 22 patients with PPS tumors treated surgically in the period 2015-2017 in our clinic.

Patients with inflammatory pathologies of PPS and secondary tumors infiltrating PPS were excluded. Data was collected and the analysis regarding the patients' age, sex, clinical symptoms of tumor during interview and physical examination, results of imaging diagnostic tests and radiological characteristics of tumor, surgical approach and postoperative complications.

A thorough medical interview and physical examination were performed in all patients who were included in the study. Moreover, patients underwent preoperative diagnostics that incorporated: electrocardiography result, radiological examination of the chest and selected morphological, biochemical and coagulation parameters. MR or contrast CT scan were used to determine the nature, extent and location of tumor in the parapharyngeal space. The decision regarding surgical approach was made on the basis of tumor location in PPS, its dimensions, apparent correlation with the neighboring anatomical structures (parotid gland, internal carotid artery, internal jugular vein, cranial nerves) and risk of malignancy.

RESULTS

The study included 10 men and 12 women. Mean age of patients was 52 years (range of 18-78 years), and mean time of symptoms was 22 months (range of 4-120 months). The majority of patients reported complaints upon admission (18/22). Only 4 (18%) patients did not present any symptoms, and diagnosis of PPS tumor was made on the basis of imaging diagnostics of the head or cervical spine, performed due to other medical conditions. Table 1 provides a summary of the main clinical symptoms in patients. Most frequently, the patients reported a feeling of an obstacle in the pharynx (6/22) and disturbance of hearing ipsilaterally (5/22). Four patients felt a tumor on the neck, swallowing difficulties were also a problem in 3 patients. In individual cases, patients reported hoarseness, speech disorders, tongue numbness and nasal congestion. Laryngological examination revealed asymmetry of palatine arches in 7 patients, a neck tumor upon palpation in 4 patients, furthermore conductive hearing loss caused by ipsilateral Eustachian tube blockage was confirmed in a hearing test in 3 patients. Vocal fold paralysis and sublingual nerve paresis were diagnosed in individual cases (table 1). Figure 1.

CT and MR tests were made preoperatively to assess tumor extension in the parapharyngeal space and for the purpose of initial recognition of its nature based on radiological features. In the case of 6 patients, on the basis of imaging tests it was concluded that the tumor is located in prestyloid space, and in

Tab. I. Type and frequency of prevalence of clinical symptoms in patients with parapharyngeal space tumors.

SYMPTOMS	NUMBER OF PATIENTS	PERCENTAGE (%)
feeling foreign body in the throat	6	27,3
hearing impairment	5	22,7
palpable tumor on the neck	4	18,2
swallowing disorders	3	13,6
headaches	2	9,1
tongue numbness	1	4,5
hoarseness	1	4,5
speech disorders	1	4,5
nasal congestion	1	4,5
SIGNS	NUMBER OF PATIENTS	ODSETEK (%)
asymmetry of palatal arches	7	31,8
neck tumor	5	22,7
conductive hearing loss	3	13,6
vocal fold paralysis	1	4,5
sublingual nerve paresis	1	4,5

Tab. II. Peri- and postoperative complications in patients with parapharyngeal space tumors.

TYPE OF COMPLICATION	NUMBER OF PATIENTS
significant perioperative bleeding	2
vocal fold palsy of paralysis	4
tongue movement disorders	3
paresis of lower branch of facial nerve	2

2 cases the tumor was described as dumb-bell. In 8 patients, the tumor filled the whole parapharyngeal space, and in 2 cases the radiologist concluded that the tumor derives from deep lobe of parotid gland. Based on MR, in 2 patients there was a suspicion of malignant tumor due to infiltration of pterygoid muscles in one case, and in the second patient, progression to deep tongue muscles. In 1 patient, a tumor with features of multi-chamber lymphangioma was located in the parapharyngeal space based on MR, and extended into the retropharyngeal space.

In the remaining 4 patients, the tumor was described in retrostyloid space.

Only in 1 patient, the longest dimension of tumor on the basis of CT and/or MR examination was smaller than 25 mm. In over half of the patients (12/22) qualified for surgery, the longest dimension of tumor was above 44 mm. Figure 2.

**Fig. 1.** Asymmetrical accentuation of the left palatal arch in patient with parapharyngeal space tumor.

Surgical resection of tumor was made in all patients. Transcervical access was the most frequently chosen (11/22) (Fig.3 i 4).

In 9 patients, the tumor was resected via transparotid transcervical access, and in 2 - transoral approach was chosen. In a patient with an MR-based suspicion of malignant tumor related to infiltration of temporal muscles, transparotid transcervical approach was performed with combined infratemporal approach for radicalization of resection, after intraoperative confirmation by histopathology of the infiltration by the tumor of the surrounding tissues. Unfortunately, in case of this patient, infiltration expanded perineurally into the base of the skull and therefore the resection was not radical. In case of the patient with infiltration of deep tongue muscles in MR, the transoral approach was performed with the partial resection of the tongue base. Furthermore, cervical approach was performed in order to control blood vessels. Transoral access was also the method of choice in the patient with suggested diagnosis of lymphangioma. In 1 patient with a suspected neuroma based on MR, the tumor of the vagus nerve was confirmed intraoperatively. Due to the young age of the patient and benign nature of the tumor, only its intracapsular resection was performed.

Significant peri- and postoperative complications are provided in table 2. Severe bleeding occurred in 2 patients during surgery and it required external carotid artery ligation in both cases. Paresis of cranial nerves after surgery was diagnosed in 5/22 patients: vagus nerve in 4, and sublingual nerve paresis in 3 (2 patients have paresis of both nerves 10th and 12th). Early implantation of phoniatric rehabilitation and speech therapy resulted in complete regression of paresis in 3 patients within 4 months post the surgery. Two patients were diagnosed with postoperative paresis of the lower branch of the facial nerve, which resolved 3 months after surgery.

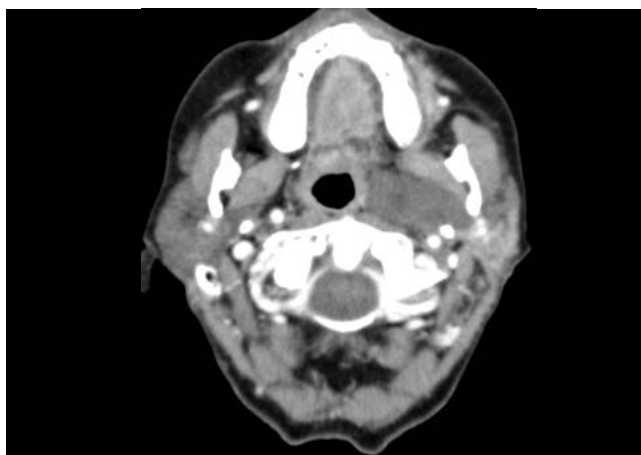


Fig. 2. CT with contrast in patient with pleomorphic adenoma of the parapharyngeal space; a) cross section with tumor, mainly incorporating the prestyloid part; b) reconstruction of axial cross sections with marked tumor size.

Final histopathological examination confirmed benign lesions in 18/22 patients, among which 11 were pleomorphic adenomas. Cancer was revealed in only 4 patients, in 3 cases it was derived from the parotid gland. In 1 patient with squamous cell carcinoma, due to the extent of infiltration, it was not possible to determine the primary site. Detailed histopathological diagnosis of the study group is provided in figure 5.

DISCUSSION

PPS tumors still remain a diagnostic and therapeutic challenge for surgeons due to their rare prevalence, hidden location and nontypical clinical symptoms as well as varying pathological types. In our study, benign lesions comprised 81.8%, whereas malignant lesions-18.2%, which remains in accordance with data cited by other authors [2,9,11]. On the other hand, statistics regarding most frequent benign PPS tumors are divergent. Most works indicate pleomorphic adenoma as the dominant diagnosis [2,5,9,14,15]. There are also works which compose of quite extensive material, where neuromas are dominating tumor's type [4,11,12]. In the analysed material, pleomorphic adenoma constituted 50% of all diagnoses.

According to literature, the most common symptoms of PPS tumors are the feeling of obstruction in the pharynx as well as neck tumor, which is comparable with the results obtained from our patients [5,6,11-13]. Other reported symptoms also include dysphagia and pain when swallowing [4]. However, it should be kept in mind that even around 40% patients may report no symptoms at all, and approximately 20% of them will not present any variations in physical examination, which comprises a potential challenge for the surgeon [11]. In our group, in 4

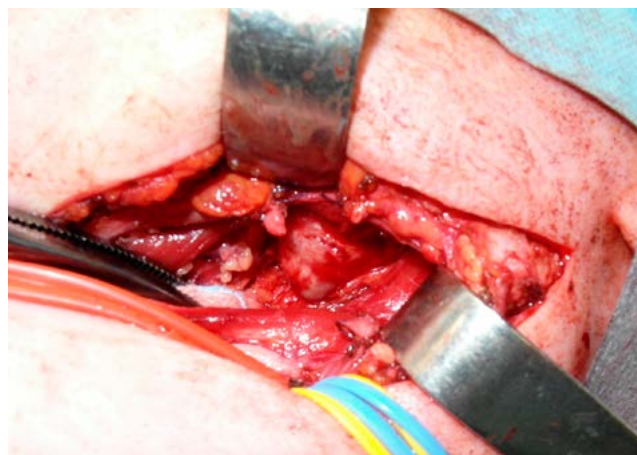


Fig. 3. Surgical field with transcranial access into parapharyngeal space (stage after removal of parotid gland, with visible lower pole of tumor)

patients no symptoms were found or the complains were not linked with PPS tumor, whereas diagnosis was made on the basis of CT and MR performed after head injury..

The hidden location of PPS tumors and characteristic slow growth of most of them causes that diagnosis is made late with an already big size of the tumor [11]. In our study, the longest dimension of tumor exceed 40 mm in as many as 12 patients, and the mean time from start of symptoms to diagnosis was 22 months.

All authors agree that preoperative analysis of CT and MR imaging results is crucial to assess tumor size and its location in the space (pre- and retrostyloid space) and to determine the association of tumor with parotid gland or the main blood ves-

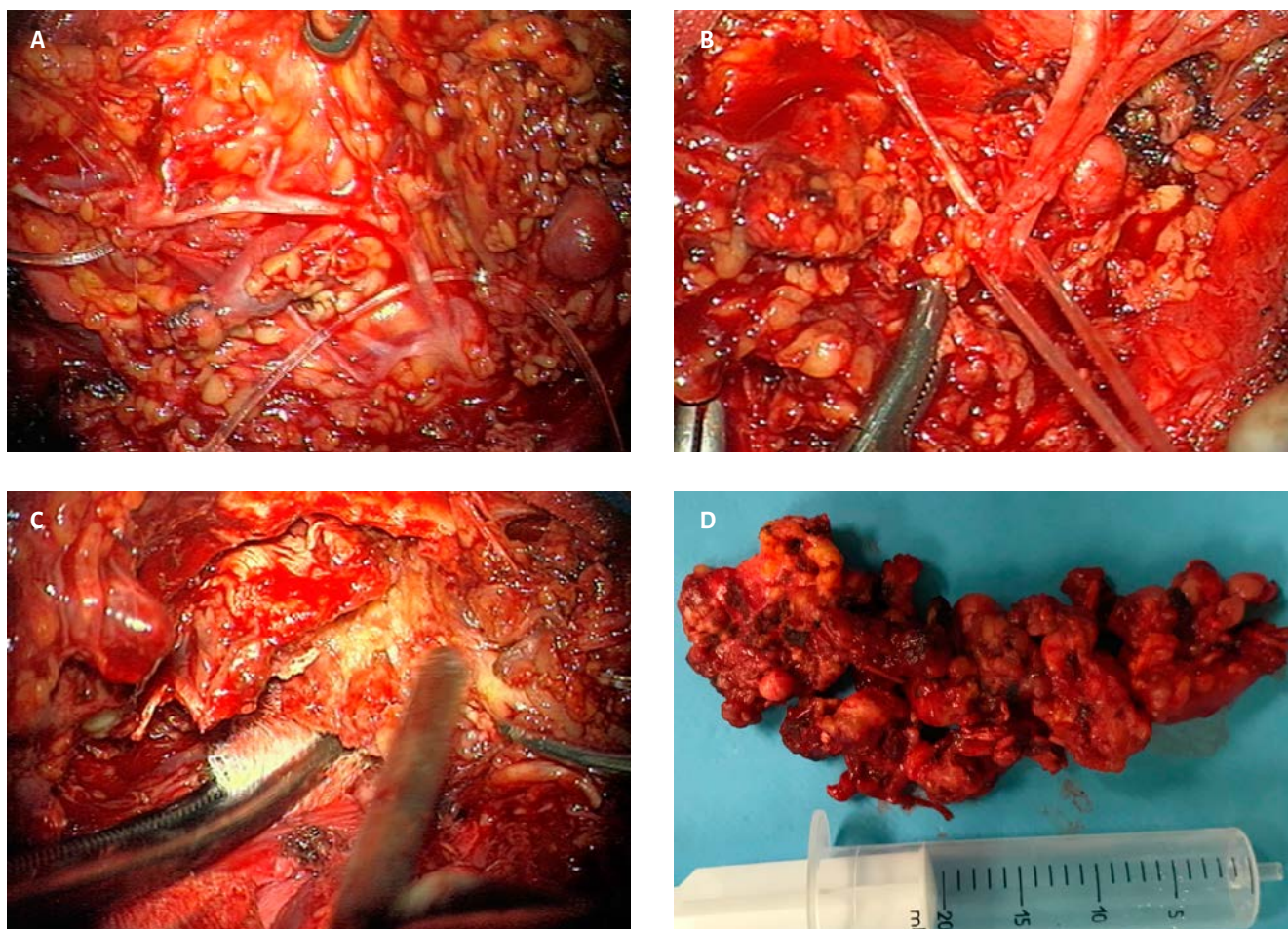


Fig. 4. Consecutive stages of tumor resection in parapharyngeal space via transparotid transcervical access: a) removal of superficial part of parotid gland; b) removal of deeper part of parotid gland; c) separation of tumor from parapharyngeal space; d.) pleomorphic adenoma after excision from parapharyngeal space.

sels [2-11]. It is also emphasized that certain radiological features may help identify malignant tumors, such as: irregular contours, infiltration of adjacent tissues and the fat layer and enlarged retropharyngeal and cervical lymph nodes [10,14]. The more and more common CT with contrast allows for precise assessment in most cases [14]. MR examination is recognized as more reliable in evaluation of soft structures and may be used in patients when CT-based information is not sufficient [12]. In case of suspicion of PPS paraganglioma, computed tomography angiography is recommended [16].

There are controversies regarding biopsy in PPS tumors. On the one hand, certainty of histopathological diagnosis in pre-operative period is invaluable, especially in cases radiologically suspected of malignant nature. However, a fine needle aspiration biopsy is hindered due to the lack of possibilities to control the sampled area in ultrasonography. Biopsy under CT is possible, but rarely applied in practice. Even more question-

able is excisional biopsy that may be associated with risk of metastasis and can put at much greater risk of complications during actual surgery due to adhesions and altered anatomical and topographical conditions [4]. Excisional biopsy is suggested in cases of nonsurgical malignant tumors, metastasis or suspicion of lymphomas in order to make a diagnosis [12]. Some authors believe that aspiration biopsy is safe in tumors located in prestyloid space [12]. Performing needle biopsy of retrostyloid space tumors may expose the patient on the risk of vascular complications and results in a large number of nondiagnostic cytological results, especially in the case of paragangliomas, or neuroma sample with a poor number of cells [17-19].

Among the described surgical approaches to PPS, transcervical access is used most frequently [4,9,12]. In this research, it comprised 50% of all surgeries. Most authors recommend this approach for retrostyloid tumors, however they also indicate that it allows to remove most tumors deriving from the parotid

gland [12]. For the purpose of better control during resection of large tumors, it is recommended to remove the parotid gland, and dissect the digastric and stylohyoid muscle, as well as stylomandibular ligament [14]. However, such access may turn out to be insufficient in the case of tumor that extend high into the base of the skull and in malignant lesions, when resection with preservation of healthy tissue margins is necessary [6,10].

In case of retrostyloid PPS tumors, especially those that involve also the deep lobe of parotid gland, transparotid transcervical approach is optimal due to the possibility of identification and safe separation of the branches of the facial nerve during resection of the tumor [14]. In our material, this approach was chosen in 6 patients with pleomorphic adenoma and in all 3 patients with malignant tumors. Transoral access has very limited recommendations according to most authors [4,12,20]. It is not routinely advised, as it does not ensure control of neural structures, and most of all of blood vessels. Selected cases of small, benign and non-vascularized tumors, which radiologically do not penetrate into the retrostyloid space, may be removed through this approach [8,12]. Dymitrijevic et al. find that in selected cases of large tumors, transoral access combined with cervical access allows for thorough and safe resection instead of mandible dissection [14]. The main recommendation for approach with mandibulotomy in PPS surgery are malignant tumors, relapses, large benign tumors and highly vascularized tumors [5,21]. Khafif et al. emphasize, that splitting the mandible ensures wide access to the base of the skull and thus, radicalization of surgery in malignant lesions [20]. Another, less frequent approach is infratemporal access used in the cases of lesions extending towards the infratemporal fossa. It was used in one of our patients suffering from squamous cancer, in whom MR revealed infiltration of pterygoid muscles.

The most severe complication of PPS tumor resections are palsies of the lower group of cranial nerves (from 9th to 12th) as well as palsy of the facial nerve in transparotid transcervical access. In functional terms, the prognosis is worst in cases of paralysis after resection of neurogenic tumors: neuromas and paragangliomas [2]. Most often, following PPS surgeries, paralysis of the vagal nerve is recognized, as the greatest number of neurogenic tumors derives from this nerve [12]. Most frequently, lack of clinical symptoms of nerve function impairment before surgery poses a challenge, which is why some authors

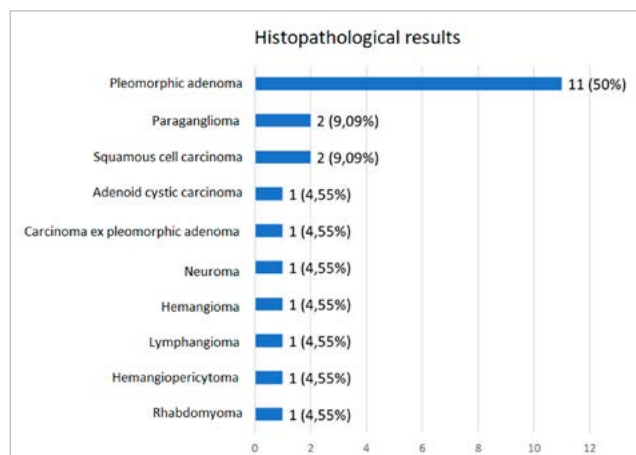


Fig. 5. Histopathological results of parapharyngeal space tumors in analyzed material.

decide to perform intracapsular excision of tumor in case of neuromas, as it allows for preservation of better function of the nerve after surgery [12,23]. Sato et al. compared results of neural function in 21 patients with PP neuromas treated with surgical intracapsular or total resection of the tumor and concluded that nerve paresis is inevitable in both methods, however, intracapsular resection decreases its severity [23].

CONCLUSIONS

PPS tumors comprise a diagnostic and therapeutic issue, mainly due to their low prevalence and non-characteristic symptoms that contribute to making a late diagnosis, as well as due to the anatomical topography of this space and its content.

CT and MR imaging has a decisive meaning in the diagnostic process and choice of surgical access.

PPS tumors most often derive from the parotid gland. Most of them are non-malignant. Pleomorphic adenoma is the most common.

Surgical resection still remains the basic method of treatment for PPS tumors, however, it may be connected with significant complications regarding voice, speech and swallowing impairment.

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Word count: 3140 Tables: 2 Figures: 6 References: 23

Access the article online: DOI: 10.5604/01.3001.0012.0485 Table of content: <https://otolaryngologypl.com/issue/11348>

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Competing interests: The authors declare that they have no competing interests.

Cite this article as: Rzepakowska A., Durmaj A., Krupa Z., Osuch-Wójcikiewicz E., Niemczyk K.: Surgical treatment results of parapharyngeal space tumors: a report of 22 cases; *Otolaryngol Pol* 2018; 72 (4): 8-15

